

Remarks

Amendments made after final rejection touching the merits may be entered upon a showing of good and sufficient reasons why they are necessary and were not earlier presented. See 37 C.F.R. § 1.116(c). The foregoing amendments were made in response to the Examiner's final rejection. Additionally, the foregoing amendments do not add features that were not originally claimed and therefore do not require additional searching on behalf of the Examiner. Accordingly, Applicants respectfully request that they be entered.

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendment, claims 1-16 are pending in the application, with claims 1, 10, and 11 being the independent claims. Claims 17-25 are sought to be cancelled without prejudice to or disclaimer of the subject matter therein. The changes incorporated in the foregoing amendment are believed to introduce no new matter, and their entry is respectfully requested.

Based on the above amendment and the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding rejections and that they be withdrawn.

Rejections under 35 U.S.C. § 102

Claim 10 has been rejected under 35 U.S.C. § 102 (b) as being anticipated by the article "Physical and Technological Features of the Arc Vacuum System for Coatings Deposition Based on the Plasma Arc Accelerator" to Semenyuk *et al.* ("Semenyuk"). The Examiner maintains that Semenyuk teaches a cathodic arc source comprising a cathode/anode process chamber 2, a means for generating a magnetic field within chamber 2, a

cathode station for location of a target 1 in electrical contact with the cathode, and that the means for generating the magnetic field 5 generates a magnetic field at the front surface of the target and has a lateral field component effective to maintain the arc on the front surface of the target during operation.

Additionally, the Examiner states that the magnetic field arrangement appears to be an intended use, and because the apparatus disclosed in the Semenyuk article is capable of performing the intended use, the present invention is anticipated by Semenyuk.

Claim 10 has been amended to remove "means for generating a magnetic field in the vacuum chamber" and "wherein the magnetic field generating means is for generating a magnetic field at the front surface of the target." Claim 10 now recites "a magnetic field generating means, wherein said magnetic field generating means is arranged to generate a magnetic field in the vacuum chamber . . . wherein the magnetic field is located at the front surface of the target . . . and zero field strength at a position above the target and inside the chamber." Semenyuk does not disclose, for example, that the magnetic field has a zero field strength at a position above the target and inside the chamber as disclosed in claim 10. Rather, Semenyuk clearly shows that the point of zero field strength of the magnetic field is at the surface (6) of the target (1). See Semenyuk, p. 872, §2.1, Figs. 1 and 2(b). Accordingly, claim 10 is not anticipated by and is patentable over Semenyuk.

Rejections under 35 U.S.C. § 103

Claims 1-9 and 11-16 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Semenyuk in view of U.S. Patent No. 5,468,363 to Falabella

("Falabella"). The Examiner states that Semenyuk discloses all the elements of claims 1 and 11 except a graphite cathode source and of claim 14 except a macroparticle filter.

With respect to claims 1 and 11, the Examiner states that Falabella teaches use of graphite cathode sources in cathode arc deposition and that the motivation for selection of graphite as the cathode source is to deposit carbon films onto the substrate. The Examiner concludes that it therefore would be obvious to modify the teachings of Semenyuk "by selecting the cathode to be a particular material, in the case of the instant claims, of graphite, since selection of a preferred material would have been an obvious design choice dependent upon the requisite coating to be applied to the substrate" as taught by Falabella.

The Examiner states with respect to claim 14 that Falabella teaches a macroparticle filter and because macroparticle filters filter macroparticles out of the plasma and thereby prevent macroparticle deposition on the part to be coated, it would have been obvious to modify the Semenyuk teaching with that of Falabella to include a macroparticle filter.

Claim 1 has been amended to remove "means for generating a magnetic field in the chamber." Claim 1 now recites "a magnetic field generating means, wherein said magnetic field generating means is arranged to generate a magnetic field in the vacuum chamber . . . and zero field strength at a position above the target and inside the chamber." Semenyuk, as noted above, does not disclose this feature of the magnetic field arrangement but instead discloses that the point of zero field strength is at the surface of the target. Additionally, Falabella also does not disclose or suggest this feature of the magnetic field. Therefore, even if it were obvious to combine Semenyuk and Falabella,

doing so would not result in the claimed invention. Accordingly, Applicants respectfully request that the Examiner withdraw the rejection of claim 1.

Claim 11 has been amended and now recites "a magnetic field . . . wherein said magnetic field has . . . zero field strength at a position above the target and inside the chamber." Again, Semenyuk, as noted above, does not disclose this feature of the magnetic field arrangement. Additionally, Falabella also does not disclose or suggest this feature of the magnetic field. Therefore, even if it were obvious to combine Semenyuk and Falabella, doing so would not result in the claimed invention. Accordingly, Applicants respectfully request that the Examiner withdraw the rejection of claim 11.

Claims 2-9 and 12-16 depend from and add additional features to claims 1 and 11 respectively, and are therefore allowable for at least the same reasons as claims 1 and 11 stated above.

Applicants' Response to Examiner's Comments in Paragraph 8

In response to Applicants' position that there would be no motivation to modify the Semenyuk device in view of the teachings of Falabella because the Semenyuk device would not work as intended, the Examiner states that it is not clear why the Semenyuk apparatus would not work using a graphite target as disclosed in Falabella. First, the Falabella device uses a Pulsed Arc Power Supply to initiate the arcing process and the Semenyuk device uses an injection of the plasma clot to initiate the arcing process. Although these triggering methods produce functional metal plasma using metal targets, neither are suitable for producing stable carbon plasma from a graphite target.

The main reason the Semenyuk device will not work using a graphite target is because the arc spot behaves very differently on a metal target than on a graphite target. The arc spot tends to move slowly over the graphite surface and conversely very quickly over the metal surface. Hence, substituting a graphite target into the Semenyuk device would render the device inoperable because arcing would tend to stay close to the initial triggering point.

Additionally, the Examiner states in the final Office Action that it is not clear why the Semenyuk device would be inoperative with a macroparticle filter. First, the Semenyuk device is designed to produce a decreased generation of macroparticles as stated in the article conclusions "[v]arying the intensity and energy of the additional ion flow (by means of varying the discharge current and voltage) it is possible, as experiments had shown, to maintain such cathode film condition when the film already provides the additional increase the electric field near the cathode surface, but still do not lead to the generation of the solid fragments owing to the film break. See Semenyuk p. 875, §3 "Conclusions", para. 2. Accordingly, one skilled in the art would not be motivated to include a macroparticle filter as it would not be necessary to do so. Further, Semenyuk teaches away from using macroparticle filters because they decrease the output ion current causing a substantial decrease in the efficiency of the process. See Semenyuk page 871, col. 2, lines 12-20. Additionally, the Semenyuk device will not function when used with a filter bend because the strong magnetic field created by the filter bend will make the source unstable. When the point of zero field strength is located at the surface of the target as disclosed by Semenyuk, use of a filter bend will suffocate and suppress the plasma, resulting in a significantly reduced output.

Thus Applicants maintain that neither of the references, alone or in combination, teaches all the elements of amended claims 1 and 11, and one of ordinary skill in the art would not have been motivated to combine the teachings of the Semenyuk and Falabella references because to do so would make the Semenyuk device unfit for its intended purpose.

Conclusion

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

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SKGF Rev. 2/13/01

Version with markings to show changes made

Marked-up version of claim 1:

1. (Once Amended) A cathode arc source for generating positive carbon ions from a cathode target, said ions being emitted in a direction substantially normal to a front surface of the target, comprising:

a cathode;

an anode;

a vacuum chamber; and

[means for generating a magnetic field in the chamber] a magnetic field generating means, wherein said magnetic field generating means is arranged to generate a magnetic field in the vacuum chamber, wherein the magnetic field has a direction substantially normal to the front surface of the target and zero field strength at a position above the target and inside the chamber, the magnetic field being the resultant of fields generated by a first field generating means located above the target and a second field generating means located below the target.

Marked-up version of claim 10:

10. (Twice Amended) A cathode arc source comprising:

a cathode;

an anode;

a vacuum chamber;

[means for generating a magnetic field in the vacuum chamber] a magnetic field generating means, wherein said magnetic field generating means is arranged to generate a magnetic field in the vacuum chamber;

a cathode station for location of a target in electrical contact with the cathode, said target having a front and a rear surface; and

means for striking an arc at the front surface of the target[;],

[wherein the magnetic field generating means is for generating a magnetic field at the front surface of the target] wherein the magnetic field is located at the front surface of the target and wherein the magnetic field has a lateral field component effective to maintain the arc on the front surface of the target during operation and a normal field component with a direction substantially normal to the front surface of the target and zero field strength at a position above the target and inside the chamber.

Marked-up version of claim 11:

11. (Once Amended) A method of striking an arc at a graphite cathode target in a vacuum chamber comprising:

- (i) generating (a) below the target, a first magnetic field having a first field direction and (b) above the target, a second magnetic field having a second field direction opposite to that of the first, so as to generate a magnetic field that is resultant from the first and second fields, wherein said magnetic field has a direction substantially normal to a front surface of the target and zero field strength at a position above the target and inside the chamber; and

- (ii) striking the arc in the resultant field.

Claims 17-25 have been cancelled.